



US 20210098869A1

(19) **United States**(12) **Patent Application Publication****Ruaro et al.**(10) **Pub. No.: US 2021/0098869 A1**(43) **Pub. Date:****Apr. 1, 2021**(54) **ELECTRONIC DEVICE WIDE BAND
ANTENNAS****H01Q 1/27** (2006.01)**H04R 1/02** (2006.01)(71) Applicant: **Apple Inc.**, Cupertino, CA (US)(52) **U.S. Cl.**CPC **H01Q 1/521** (2013.01); **H01Q 13/10**(2013.01); **H04R 1/025** (2013.01); **H04B****1/385** (2013.01); **H01Q 1/273** (2013.01);**H01Q 1/48** (2013.01)(72) Inventors: **Andrea Ruaro**, Campbell, CA (US);
Eduardo Jorge Da Costa Bras Lima,
Sunnyvale, CA (US); **Mario Martinis**,
Cupertino, CA (US); **Dimitrios**
Papantonis, Cupertino, CA (US);
Jayesh Nath, Milpitas, CA (US);
Mattia Pascolini, San Francisco, CA
(US)(21) Appl. No.: **16/584,159**(22) Filed: **Sep. 26, 2019****Publication Classification**(51) **Int. Cl.****H01Q 1/52** (2006.01)**H01Q 13/10** (2006.01)**H01Q 1/48** (2006.01)**H04B 1/3827** (2006.01)(57) **ABSTRACT**

An electronic device may have a housing with metal side-walls. One of the metal sidewalls may have an opening. The electronic device may have a speaker module that has a speaker housing member. Conductive structures on the speaker housing member may have an opening that forms a slot element. The opening of the metal sidewall may be aligned with slot element. The slot element and an interior cavity of the speaker housing member may form a cavity-backed slot antenna. An antenna feed structure may be disposed at the opening of the speaker housing member. An antenna feed may be directly coupled to the antenna feed structure. The antenna feed structure may indirectly feed the slot antenna resonating element by capacitive coupling. A sealing member may be disposed at the opening of the metal sidewall.

